



Oncology

Frequency and efficacy of additional investigations following incomplete colonoscopies: A population-based analysis



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ABSTRACT

Background: Limited data are available on the follow-up of patients with incomplete colonoscopy following positive faecal occult blood testing. Our study aimed to determine the proportion of and reasons for incomplete colonoscopies, the proportion of patients who completed colonic evaluations, the methods used and the subsequent findings.

Methods: A total of 9483 colonoscopies performed after positive testing in a colorectal cancer screening programme setting were included. The study was prospective for index colonoscopy findings and partly retrospective for follow-up.

Results: Overall 297 colonoscopies were incomplete (3.2%). A secondary colonic evaluation was deemed necessary in 245 patients, of which 126 underwent an additional examination (51.4%). Radiology was the primary method used for complete colonic evaluation, whereas a repeat colonoscopy was performed in only 6.4%; the examination was normal in 119 patients (94.4%). A mucosal high-grade neoplasia was removed in 1, and multiple (≥ 3) adenomas were removed in 2 patients.

Conclusions: The present screening programme with biennial faecal occult blood testing revealed a high colonoscopy completion rate, a low rate of secondary colonic evaluation, infrequent use of colonoscopy for completion, and a low detection rate of significant neoplasia.

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1. Introduction

Both population-based and cohort studies have indicated that colonoscopy is associated with a significant decrease in the mortality and incidence of colorectal cancer (CRC) [1–6]. However, the magnitude of this decrease varies greatly across studies and depends on whether the location (i.e., proximal or distal) of the CRC is considered. Such performance variations may indicate an underlying quality issue with respect to screening or diagnosis among endoscopists. Among the many quality indicators recommended for colonoscopies [7], both adenoma detection and caecal intubation rates were demonstrated to be predictors for post-colonoscopy cancer incidence [8–11]. Therefore, appropriate caecal intubation rates of $\geq 90\%$ in routine clinical practice and $\geq 95\%$ in screening colonoscopies were recommended [7].

Completion rates and explanatory factors for incomplete colonoscopy have been reported in very few population-based studies [12,13]. Information on the follow-up of patients with an incomplete colonoscopy in daily practice, including the proportion of patients who subsequently receive a secondary colonic evaluation and the number of subsequently diagnosed neoplastic lesions, remains scarce [14,15]. To the best of our knowledge, no studies restricted to colonoscopies performed after positive faecal occult blood testing (FOBT) have been reported. However, the prevalence of advanced neoplasia as detected by colonoscopy after a positive FOBT is so high [16,17] that we could hypothesize that incomplete colonoscopies might lead to high rates of missed advanced neoplasia in the context of CRC screening by FOBT.

In the present population-based study, our primary objectives were as follows: (1) to determine the rate of incomplete colonoscopies, including not only examinations where the caecum was not reached but also those that did not permit a satisfactory examination of the colonic mucosa due to poor bowel preparation; (2) to identify the reasons for incomplete colonoscopy; and (3) to determine the frequency and efficacy of additional investigations to achieve complete colonic evaluation.

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2. Methods

2.1. Study cohort

'Ille-et-Vilaine' was one of the first administrative areas in France to implement the national programme for CRC screening using FOBT (Hemoccult II™) in 2003. We previously reported the characteristics of this screening programme [17,18]. Individuals aged between 50 and 74 years with an average risk of CRC and without contraindications to colonoscopy were invited to complete the testing every two years. National guidelines for completion after incomplete colonoscopy did not exist when the screening programme started, except for cases with obstructive tumour in the distal colon. In such cases, a radiological examination before surgery or a new colonoscopy within 6 months after surgery was recommended. European [19] and French [20] guidelines for incomplete or inadequate colonoscopy were published in 2010. In cases of incomplete or inadequate colonoscopy, these guidelines recommended to "undergo repeat colonoscopy or an alternative complete colonic examination. The decision may depend on patient factors and local factors, such as waiting lists and whether the examination could be performed by a more experienced endoscopist".

During the study period, the population in the area consisted of approximately one million inhabitants. The participation rate varied from 41.5% to 51.5% among the five consecutive rounds of screening organized from February 2003 to February 2012. The rate of participation was greater for females than for males (female-to-male ratio, 1.1) throughout the study, and the rate of FOBT positivity was greater for males than for females (female-to-male ratio, 0.7). Positive FOBT was followed by a colonoscopy in more than 90% of cases in each round without any difference in compliance between males and females, and 9483 index colonoscopies were performed by 94 gastroenterologists during this period. After the exclusion of 268 cases for which the completeness of colonoscopy was likely but not certain due to missing medical records, the cohort consisted of 9215 index colonoscopies performed under general anaesthesia. Poor bowel preparation was subjectively reported by each gastroenterologist without reference to any score. No data on the kind of bowel preparation and protocols used were recorded. No centre in our administrative area held dedicated endoscopy sessions for FOBT-positive patients.

Caecal intubation was recorded at the time of colonoscopy, based on the colonoscopist's assessment of the extent of intubation using anatomical landmarks, but no photographic evidence of caecal intubation was required. A colonoscopy was defined as incomplete when caecal intubation was unsuccessful or when the colonic mucosa could not be satisfactorily examined due to poor bowel preparation despite successful caecal intubation.

2.2. Study design

The CRC screening programme was announced and approved by the 'Commission Nationale de l'Informatique et des Libertés' (CNIL) in August 2002 (No. 812571). This research study was approved by the 'Comité Consultatif pour le Traitement de l'Information en matière de Recherche dans le domaine de la Santé' (CCTIRS).

Patients with incomplete colonoscopies were identified from the ADECI 35 (Association for the screening of cancer in Ille-et-Vilaine area) database. The following variables were prospectively entered into the database: patients' gender and age, the reason for incomplete colonoscopy (e.g., anatomical difficulties, obstructive lesions, or poor preparation), the segment reached by the scope and any findings during the colonoscopy. When several neoplastic lesions were detected, only the most advanced lesion was included in the analysis.

If information on additional attempts to achieve complete colonic evaluation was lacking in the database, a questionnaire was sent by mail to the gastroenterologist who had performed the incomplete index colonoscopy. Missing data was found for 39 of the 94 gastroenterologists (41.5%). The gastroenterologist was contacted by phone if no response was obtained within one month. The questionnaire was completed by 15 of the 39 gastroenterologists after being reminded by mail, or by phone. Until the end point for data collection in July 2013, we sought to determine whether a secondary examination was performed and, if so, the type of examination: we considered a repeat colonoscopy, computed tomography (CT) colonography with water, CT colonography with gas, or barium enema as adequate alternatives for a second complete colonic examination. These methods were considered appropriate if they were performed within a 6-month period after incomplete colonoscopy or after colectomy for CRC. Abdominal CT scan and ultrasonography, which are usually performed for cancer staging, were not considered appropriate methods of achieving complete colonic evaluation. Follow-up information was obtained from 279/297 incomplete colonoscopies (93.9%).

For the follow-up studies, we exclusively considered the patients who required a secondary examination. Thus, we excluded 34 patients with incomplete colonoscopies from the analysis due to either (1) an obstructive neoplasia located in the proximal colon (all 32 patients who underwent a right colectomy did not require a repeat colonic examination) or (2) obstructive CRC in the distal colon, which was inoperable due to massive liver metastases or severe co-morbidities in 2 patients. Information that became available after additional investigations was recorded for the remaining 245 patients.

2.3. Statistical analyses

To determine the frequency of incompleteness, the reason for incomplete colonoscopy and the characteristics of the patients as well as their colonoscopy findings, this analysis comprised a group of 297 patients. For the follow-up study, the analysis involved a group of 245 patients who required further examination after the exclusion of the 18 patients without any follow-up information and the 34 patients who did not require a secondary colonic evaluation.

For comparisons between the groups, analyses were performed using Student's *t*-test for continuous variables. The categorical variables were analyzed with the chi-squared test or Fisher's exact test. All analyses were univariate, and a *p*-value of 0.05 defined the significance threshold.

3. Results

3.1. Incomplete colonoscopies

Among the 9215 colonoscopies, 297 were classified as incomplete (3.2%): the scope did not reach the caecum in 244 cases (2.6%), and the colonic mucosa could not be satisfactorily examined in 53 other cases due to poor bowel preparation despite caecal intubation (0.6%). In the group of 297 patients with incomplete colonoscopies (females 50.8%), the mean age was 63.2 ± 7.2 years. The mean age and the gender ratio did not significantly differ between this group and the group of patients with complete colonoscopies ($n = 8918$, females 48.2%, mean age 61.8 ± 7.2 years).

Among the 31 gastroenterologists who had performed at least 50 colonoscopies (median 274, range 62–694) during the study period, the median completion rate of colonoscopy was 96.8%. Only four (12.9%) did not fulfil the objective of at least a 95% completion rate (93%, 92.8%, 87.9% and 80.8%). However, when the analysis was restricted to caecal intubation rates, only two gastroenterologists

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